

DOCKET NO. H01.2-9610

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
APPLICATION FOR UNITED STATES LETTERS PATENT**

INVENTORS:

Ulrich Arndt, Andreas Arning, Heinrich Behrmann, Helmet Bommrowitz, Thomas Heinrich, Jürgen Hinzpeter, Thomas Jacob, Peter Lüneburg, Nils Petersen, Hans-Joachim Pierags, Jürgen Schikowski, Elke Wittenberg, Hans Wolf, Ulrich Zeuschner.

TITLE:

A DIE FOR A ROTARY COMPRESSION PRESS

ATTORNEYS:

RICHARD A. ARRETT, ESQ.
VIDAS, ARRETT & STEINKRAUS
Suite 2000
6109 Blue Circle Drive
Minnetonka, MN 55343-9131
Phone: (612) 563-3000
Facsimile: (612) 563-3001

A DIE FOR A ROTARY COMPRESSION PRESS

CROSS-REFERENCE TO RELATED APPLICATIONS

Not Applicable

5 STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH

Not Applicable

BACKGROUND OF THE INVENTION

- This invention relates to a die for a rotary compression press. As is known, rotary
10 compression presses have top and bottom rams which are axially guided in respective die
guides of the rotor and which interact with die-plate bores of the die-plate. Actuation of
the rams is effected by means of stationary control cams. The compressing process,
which is performed by means of the rams, is caused by pressure rollers against which the
rams run and which press the rams downwards or upwards for the purpose of
15 compressing the powdered material filled into the die-plate bores.

It is known to shape the rams from two portions, namely a shank-like holder
which interacts with the pressure rollers and an insert which is adapted to be releasably
connected to the ram holder. The ram insert constitutes the compressing process tool
proper and, thus, determines the contour of the compact.

- 20 From the utility model DE 88 16 064, a rotary compression press has become
known in which the shank of the compressing rams has a toothing which interacts with a
toothed rack which is stationary. The rotary motion of the top and bottom rams
immediately following the compressing process and during the extraction of the rams
from the die-plate bore is intended to achieve a separation from the surface of the
25 compacted tablet.

- From EP 0 448 190, a rotary compression press has become known in which the
top and bottom rams are guided in bushings which, in turn, are rotatably supported and
toothed in order to cooperate with a stationary toothing. The ram shanks are linearly
guided in the bushings. For a reduction in wear on the pressure rollers and those heads
30 out of the heads which face the rollers it has also become known to design the rams in
two portions and to configure them so as to be rotatable against each other. The

gear-operated drive now takes place only on the lower ram portion which as was stated can be rotated with respect to the upper one.

It is the object of the invention to provide a die for rotary compression presses in which a separate drive may be dispensed with for a relative rotation with respect to the
5 compacted tablet.

BRIEF SUMMARY OF THE INVENTION

According to the invention, the projection of the die insert is helically guided in the bore between axially spaced stops and is biased by a spring towards the front-end
10 face of the die holder. At the start of a compressing process, the die insert moves into the die holder up to a firm stop. During this axial motion, a limited rotary motion of the die insert takes place at the same time. After the compressing operation, the die is raised and the spring restores the die insert back to the initial position. At this time, the die insert performs a rotation, which causes it to separate from the tablet.

15 Various constructional solutions can be imagined in realizing a die of the type described. According to an aspect of the invention, one consists in that a threaded spindle is connected, in a non-rotary relationship, to the free end of the projection and the bore has disposed therein, in a non-rotary relationship, a spindle nut with which the threaded spindle interacts. According to another aspect of the invention, the spindle nut may be
20 located by means of radial pins in the die holder. According to a further aspect of the invention, the projection of the die insert has at least one radial trunnion which engages a groove of the die holder wherein said groove is sized so as to allow for an axial motion of the die insert. According to a further aspect of the invention, the trunnion can be the end of a radial pin by which the spindle is located in a bore of the projection.
25 For an efficient transmission of the compressing force from the die holder onto the die insert, an aspect of the invention provides that the axial motion of the die insert is limited by its abutting action against the front-end face of the die holder.

For an efficient separation of the die face from the surface of the compacted tablet, it is sufficient to effect a relative rotational motion through a limited angle of
30 rotation. For example, the angle of rotation is 10 to 30°, preferably about 20°.

The invention will now be explained in greater detail with reference to an

embodiment shown in a drawing.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

While this invention may be embodied in many different forms, there are
5 described in detail herein a specific preferred embodiment of the invention. This description is an exemplification of the principles of the invention and is not intended to limit the invention to the particular embodiment illustrated.

The single Figure shows a section through a die according to the invention.

10 DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawing, the die has a die shank or die holder 10 including a head
12 which, in a known manner, interacts with pressure rollers of the rotary compression
press (not shown). The die holder 10 is guided in bores of the die guide (not shown) and
is prevented from rotating by a key 14. A die insert 16 can be seen at the lower end of the
15 die holder 10. It comprises an approximately cylindrical tool portion 18, a
trunnion-shaped cylindrical projection 20, and a threaded spindle 22. A stepped bore is
formed on the die holder end opposed to the head 12. The first bore portion which is of
the largest diameter has slidably guided therein the projection 20. Another bore portion
which is of a somewhat smaller diameter has disposed therein a spindle nut 24 which is
20 axially located and secured against rotation in the bore portion by means of two radial
pins 26, 28 which are opposed to each other. The threaded spindle 22 interacts with the
nut 24. A last bore portion which is of an even smaller diameter has disposed therein a
helical compression spring 30 which bears against the bottom of the bore and acts upon
the spindle 22, biasing it away from the head 12.

25 Radially extended through the projection 20 is a cylindrical pin 32, which
protrudes like a trunnion on the two sides of the projection 20. The protruding portions
are disposed in radial slots 34 and 36 of the die holder 10 with the width of the slots 34,
36 distinctly being larger than the diameter of the pin 32.

The lower end of the die holder 10 has mounted thereon a sleeve 38 which covers
30 the slots 34, 36 and extends, in part, across the tool portion 16. The latter has received, in
a ring groove, an O-ring 40 which sealingly interacts with the inside of the sleeve 36.

This prevents the entry of impurities.

The drawing shows the state of the die that it takes if no compressing process is performed. During the compressing process, the tool portion 18 gets into contact with the material beim compressed. This generates a relative axial force between the insert 16 and the die holder 10. The insert is urged towards the die holder 10 and is rotated at the same time because of the interaction of the nut 24 and the spindle 22 until the upper shoulder 42 of the tool portion comes to bear against that front-end face 44 of the die holder 10 which faces it. This has to be the case not later than at the point where significant compressive forces are built up to compact the tablet. When the die holder 10 is raised subsequently the die insert 16 may be pushed downwards again via the previously tensioned spring 30. During this motion, a certain rotation of the die insert 16 will also take place and, hence, a relative rotation between the tablet and the die face turned thereto. This will cause a separation between these components even if a certain adhesion has occurred before.

15 The dimensions described are such that the pin 32 does not strike against the upper side of the slots 34, 36; the faces 42 and 44 will come to bear against each other before. Therefore, the pin 32 merely needs to absorb the force of the spring 30 or the impact which is produced when the pin comes to bear against the underside of the slots 34, 36.

20 The above Examples and disclosure are intended to be illustrative and not exhaustive. These examples and description will suggest many variations and alternatives to one of ordinary skill in this art. All these alternatives and variations are intended to be included within the scope of the attached claims. Those familiar with the art may recognize other equivalents to the specific embodiments described herein which
25 equivalents are also intended to be encompassed by the claims attached hereto.